Fingerprint Recognition of Newborns Baby

PROPOSAL

Submitted By

Mr. Mohammed Hussein Abdulaziz Shabil
Email : shobel2014@gmail.com
Phone Number : 7350865978

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Under the guidance of

DR.H.S. FADEWAR
ASSISTANT PROFESSOR, SCHOOL OF COMPUTATIONAL SCIENCES
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED (M.S.)

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1- ABSTRACT

Infant abduction, swapping, missing, illegal adoptions and kidnapping are increasing issues in the hospitals, birthing centers, health centers and in other places where multiple births occur simultaneously.

A biometric system using the fingerprint of the newborn is proposed to overcome such issues. Authentication and identification of infants and toddlers is a major challenge in various organizations.

Fingerprint recognition system works well in authenticating and identifying the adults. However, in case of infants and toddlers, it faces the challenges like low quality of fingerprint images and improper enrollment, and thus reducing the recognition accuracy.

In this work, we develop a fingerprint recognition algorithm with emphasis on feature extraction for the automatic recognition of newborns and infants.

Keywords—
Biometrics, Fingerprint recognition, Newborn, Identification, Infants, toddlers.

2- INTRODUCTION

In 1899, Sir Francis Galton [1] first studied the variations encountered in the inked fingerprint impressions of an infant captured over time (from about 9 days to 4.5 years of age). He concluded that it was not feasible to identify infants in the age range of 0-2.5 years using inked fingerprint impressions.

More recently, the Joint Research Center of the European Commission published a technical report [2] devoted to the question of whether or not automated fingerprint recognition for children is feasible.

The study concluded that (i) children can be identified using fingerprints when the time difference between the two captured impressions is less than 4.5 years, and (ii) image quality is a decisive factor in fingerprint recognition. Gottschlich et al. [3] studied the effect of adolescent growth on the accuracy of fingerprint matching systems, and showed that (i) fingerprint growth can be modeled.

using an isotropic growth model, and (ii) matching accuracy of fingerprint systems can be improved by up scaling the fingerprint images using this model when matching fingerprint images of adolescents collected over time.

Figure (1) Some Newborns with Fingerprints them of the Republic of India

Biometric recognition has been actively researched for many decades with the aim to solve the problem of person identification. Many of the techniques have been successfully deployed in a wide range of civil and forensic applications. However, almost all of the techniques are designed for adults or teenagers, not for infants. These techniques may not be useful for infants directly since some of the biometric modalities, e.g. face, are not stable shortly after birth for the purpose of automatic recognition. DNA is supposed to be the most accurate means of child recognition (except in the case of identical twins). However, the current DNA based identification method is not suitable for real-time application and may also be viewed as an invasive procedure due to the inconvenience in sample capture. Further, the use of DNA may raise some privacy concerns.

In recent years, several works were conducted to analyze the suitability of using fingerprints in children .

3- TECHNOLOGIES

Biometric technologies are defined as “automated procedures of authenticating or distinguishing the uniqueness of a living person based on the physiological or behavioral characteristic”.

A device to scan and capture a digital or analog image of a living personal characteristic, a compression, processing and comparison of the image to a database of stored images and Interface with applications systems.

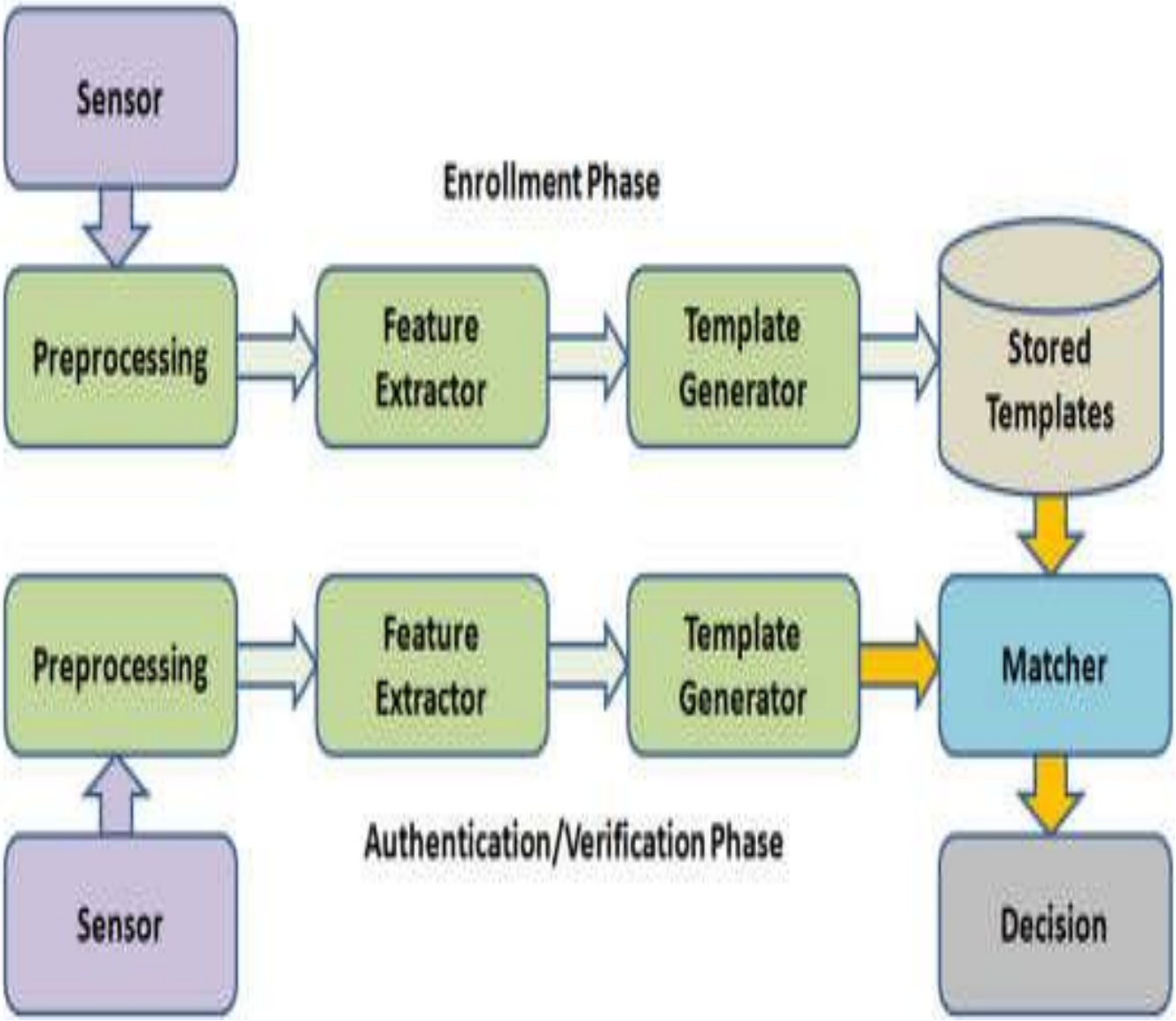

Figure (2) common framework of biometric based recognition system

4- LITRETURE OF REVIEW

There are several works related to this research....

Jain et al developed toddler and infant recognition software [4]. The software was compared to commercial fingerprint recognition SDK. The proposed software has better performance but found some obstacles where the resulting accuracy greatly affects the image quality as well as the condition of the finger surface. This problem makes the feature extraction process of the fingerprint becomes difficult.

Aroraetal proposed a new method for fingerprint matching [5]. They proposed exemplar latent feature for latent feature extraction and matching to enhance recognition performance.

Schumacher [6] compares three commercial SDKs for fingerprint recognition, Bozorth, Vendor 1, and Vendor 2, in which three commercial SDKs are used to process baby and toddler fingerprints.

Gottschlich *et al.* [7] have analyzed the child aging effect on fingerprint recognition accuracy. They have modeled the fingerprint growth with the help of an isotropic growth model which is used to improve the accuracy of fingerprint matching.

Andreas *et al.* [8] have investigated the impact of children age on different hand based recognition systems viz; Finger, Palm, Hand-geometry and Digitprint. In addition, feature and the instance level performance impact are analyzed based on different age group. They found worse results for 3-10 age group in case of fingerprint and palm print. However, geometry features can give better performance results for the same age group. In addition, the features of the age group 19+ can give good performance results.

[9] graph-based matching [10] and string-based matching [11] For fingerprint matching minutiae-based matching technique has been widely used. Here, minutiae from the fingerprint images are derived and matching is performed based on minutiae location. In case of two different locations of minutiae points, matching may be failed, and thus it requires proper pre-processing and post-processing of images to derive reliable features. In addition, it does not consider the significant information of the fingerprints.

The filter bank based fingerprint matching algorithm [12] applies the bank of filters [13] for fingerprint recognition. Here, Gabor filter [14] is used to derive local and global information of a fingerprint by considering eight directions. This algorithm first identifies the reference point and region of interest in the given fingerprint. It tessellates the region of interest for the further processing. With the help of Gabor filters, it gives the region of interest in eight directions so that local ridge characteristics and global configuration of a fingerprint can be captured [15]. Then the average absolute deviation is calculated by considering the mean of gray values in each sector, which is defined as finger code (feature vector). It applies the Euclidean distance method to the stored finger code and test finger code for matching.

Jain *et al.* [15] have performed minutiae extraction by upsampling the fingerprints. Here, the test fingerprint is matched with the fingerprint templates collected during enrollment and matching scores of the thumb and index finger are combined for the improved performance.

Jain *et al*. [16] have developed a fingerprint database of 66 infants in India. In their work, an image enhancement algorithm is designed and features are extracted and matched using commercially available schemes.

5- SIGNIFICANCE OF THE STUDY

primarily due to the lack of security measures in hospitals and intensive care centers. Many cases have been reported about infant swapping, abduction from hospitals and erroneous transfers of newborns.

Gray et al [17] have investigated that there may be 50% (out of 34) false recognition of newborn babies in US.

In China, many cases of abducting babies and illegal adoption have been reported [18]. To address such problems for new born babies, it is required to develop an efficient system which can identify the children and keep the track of given vaccines.

The DNA examination is proven to be efficient in the univocal identification of individuals, but it comes at high cost and demands

sophisticated laboratory procedures, therefore cannot be used in real-time applications. Hence, the current study aims at introducing new intelligent approaches using artificial intelligence concepts create system for fingerprint recognition is important for newborn personal authentication, since it is a noninvasive method, of easy applicability, low cost, wide acceptance .

Figure (3) Models of those who have been identified

6- STATEMENT OF THE PROBLEM

Our aim is create system low cost solution to the newborn violence rather than the expensive DNA procedure and demands sophisticated laboratory procedures.
To solve problems related to birth record, baby exchange and vaccination.

7- OBJECTIVES AND CHALLENGES

The objective of the proposed recognition system is to efficiently and accurately authenticating, identifying the infants and toddlers based on their fingerprints.
we seek for create Integrated system (Stable over time), uniqueness (Distinct for each person), ergonomic, low cost (Accessible to all), lifelong usability, Portability and acceptability .

There challenges in Infant Fingerprint Recognition the most important :

- Motion blur and image distortion
- Small finger size
- Dry/wet/dirty fingers
- Small inter-ridge spacing (4-5 pixels) vs. (9-10 pixels) for adults .

8- RESEARCH METHODLOGY

1) Acquire the fingerprints of newborns and infants using a fingerprint scanner or take it using a digital camera.
2) Applying the appropriate pre-processing algorithm to acquired fingerprints.
3) Development of a robust algorithm to extract features for pre-processed fingerprints.
4) Merging an appropriate matching algorithm and decision making unit with the proposed feature extraction algorithm to create a comprehensive fingerprint recognition system.
5) Suggested recognition system testing with MATLAB® performance evaluation, using FAL and FRF.
6) Comparative analysis of the performance of the proposed fingerprint recognition system and existing fingerprint recognition systems.

9- PROPOSED PLAN

Business plan of the year and objectives to be achieved :

Year 1:

- Literature Survey.
- Theoretical analysis of the existing different schemes already used for feature selection.

Year 2:

- Developing scheme for feature selection.
- Describes an application of presented a new scheme of feature selection.
- Assessment of experimental results in terms of recognition rate.

Year 3:

- Interpretation of the experimental result.
- create the practical system of thesis .

Year 4:

- Preparation of final synopsis and thesis.
- Submission of synopsis and thesis.

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Signature
Research Scholar
Mr. Mohammed Hussein Shabil

02/03/2020.

Signature
Research Supervisor
Dr. H.S FADEWAR

Dr. H.S. Fadewar
M.Sc. Ph.D. (CS)
Assistant Professor
School of Computational S...
Swami Ramanand Teerth Ma...
University, Nanded (M.S.)

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